


N. GREGORY MANKIW NINTH EDITION

PRINCIPLES OF ECONOMICS



CHAPTER 8 Application: The Costs of Taxation

Interactive PowerPoint Slides by: V. Andreea Chiritescu Eastern Illinois University

Modified by Joseph Tao-yi Wang

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

IN THIS CHAPTER

- How does a **tax** affect consumer surplus, producer surplus, and total surplus?
- What is the **deadweight loss** of a tax?
- What factors determine the size of this deadweight loss?
- How does tax revenue depend on the size of the tax?

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

Review

- A tax
 - Drives a **wedge** between the price buyers pay and the price sellers receive
 - Raises the **price** buyers pay
 - Lowers the price sellers receive
 - Reduces the **quantity** bought and sold

These effects are the same whether the tax is imposed on buyers or sellers

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

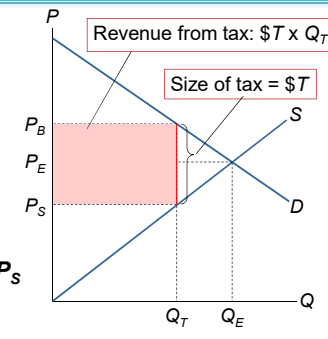
REVIEW: The Effects of a Tax

Equilibrium with **no tax**:

Price = P_E
Quantity = Q_E

Equilibrium with **tax = \$T** per unit:

Buyers pay P_B
Sellers receive P_S
Quantity = Q_T



Revenue from tax: $\$T \times Q_T$

Size of tax = $\$T$

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

How a Tax Affects Market Participants

- Total surplus = Consumer surplus + Producer surplus
 - Maximized at equilibrium
- With taxes:
 - **CS** decreases (higher P_B , lower Q_T)
 - **PS** decreases (lower P_S , lower Q_T)
 - Government gains tax revenue (per unit tax * Q_T)
 - What happens to total surplus?

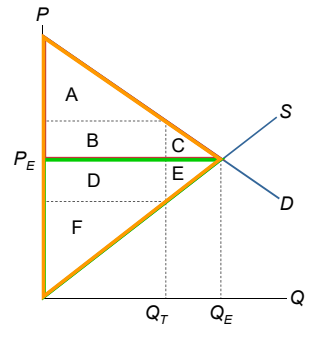
© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

EXAMPLE 1: The Effects of a Tax – 1

Without a tax,

CS = A + B + C
PS = D + E + F
Tax revenue = 0

Total surplus = **CS** + **PS**
= A + B + C + D + E + F



© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

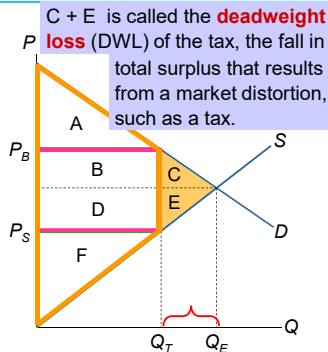
EXAMPLE 1: The Effects of a Tax – 2

With the tax,

- **CS** = A
 - **PS** = F
 - Tax revenue = B + D
- Total surplus
= **CS** + **PS** + tax revenue
= A + B + D + F

The tax reduces total surplus by C + E

$Q_E - Q_T$ = units not sold because of the tax



© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

EXAMPLE 2: DWL and the Gains From Trade

Zaria is taking her laundry to Ethan's dry cleaning and laundry services business.

For this arrangement, each month, Zaria is willing to pay NT\$3300, and Ethan's cost is NT\$2800. They agree on a price of NT\$3000 per month.

- Calculate **CS**, **PS**, and **TS**.
- The government imposes a NT\$700 tax on all laundry service providers. What happens to **CS**, **PS**, and **TS**?

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

EXAMPLE 2: Solutions, A

Zaria's **WTP** = NT\$3300; Ethan's cost = NT\$2800
P = NT\$3000 per month.

A. Calculate **CS**, **PS**, and **TS**.

- Zaria's **CS** = **WTP** - **P** = 3300 - 3000 = NT\$300
- Ethan's **PS** = **P** - cost = 3000 - 2800 = NT\$200
- **TS** = **CS** + **PS** = NT\$500

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

EXAMPLE 2: Solutions, B

Zaria's **WTP** = NT\$3300; Ethan's cost = NT\$2800
P = NT\$3000 per month.

B. \$700 tax

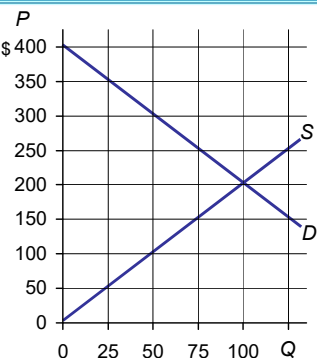
- Ethan needs 2800 + 700 = NT\$3500 to provide laundry services to Zaria, but
- Zaria's **WTP** = NT\$3300!! Trade doesn't happen!
- The tax has made both worse off: **DWL** = NT\$500
- How about the government? The government gets NT\$0 in tax revenue because Ethan and Zaria are not trading.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

Active Learning 1: Analysis of a Tax

A. Compute **CS**, **PS**, and total surplus without a tax.

B. If a \$200 tax per unit is imposed, compute **CS**, **PS**, tax revenue, total surplus, and **DWL**.



© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

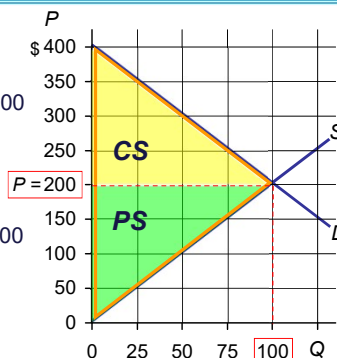
Active Learning 1: A. Without a Tax

A. Without tax:

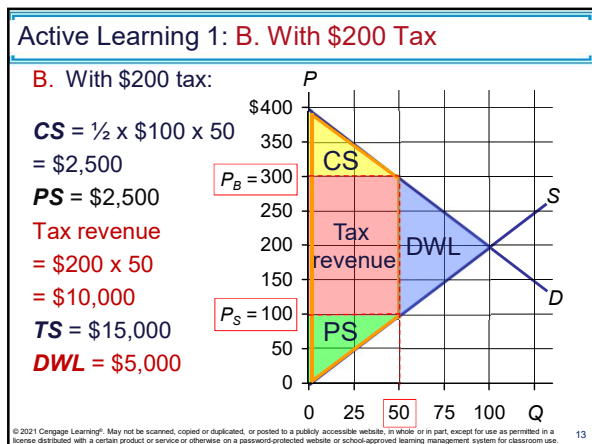
$$CS = \frac{1}{2} \times 200 \times 100 = \$10,000$$

$$PS = \frac{1}{2} \times 200 \times 100 = \$10,000$$

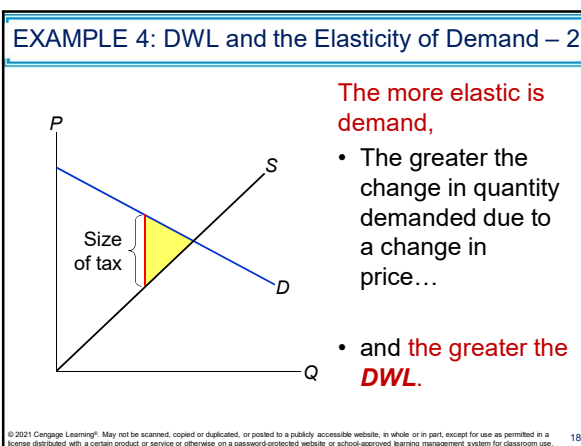
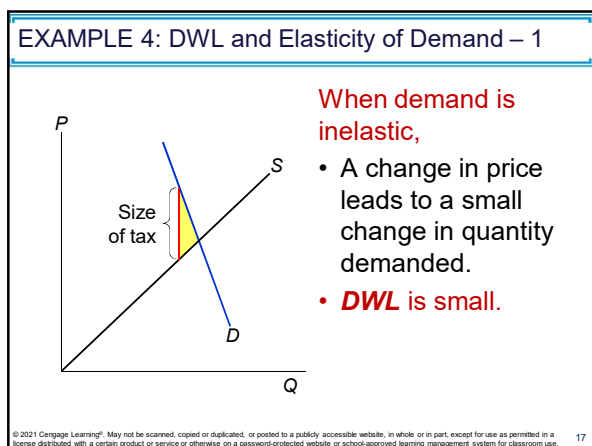
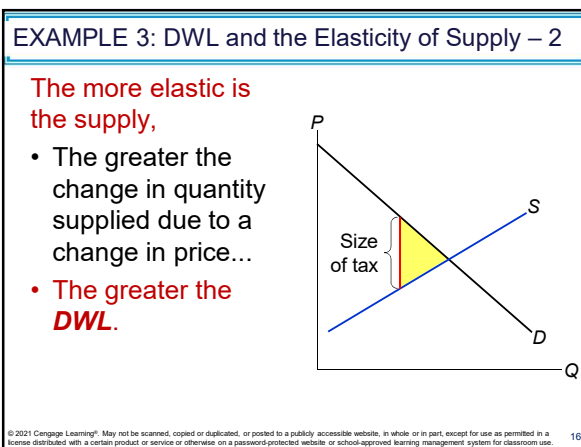
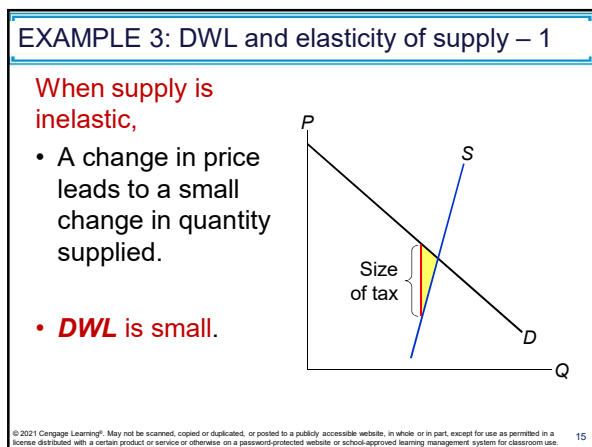
$$TS = \$20,000$$



© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.



- ### The Determinants of the Deadweight Loss
- Price elasticities of supply and demand
 - More elastic supply curve
 - Larger deadweight loss
 - More elastic demand curve
 - Larger deadweight loss
 - The greater the elasticities of supply and demand
 - The greater the deadweight loss of a tax
- © 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.



Active Learning 2: Elasticity and the DWL

In each situation, explain if the DWL of a tax would be larger if the tax were imposed on:

- A. Only Mountain Dew or soda in general?
- B. Airfare in the short run or airfare in the long run?
- C. Groceries or meals at fancy restaurants?

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

19

Active Learning 2: A. Mountain Dew or Soda?

A. Mountain Dew or soda ?

From Chapter 5:

A good with **many close substitutes** (such as Mountain Dew) has a more price-elastic demand than a broadly defined good (such as soda).

- So, a tax on Mountain Dew would cause a larger DWL than a tax on soda.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

20

Active Learning 2: B. Short Run or Long Run?

B. Airfare in the short run or airfare in the long run?

From Chapter 5:

The price elasticities of demand and supply are **larger in the long run** than in the short run.

- So, a tax on air travel would cause a larger DWL in the long run (when the demand and supply of airfare are more elastic) than in the short run.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

21

Active Learning 2: C. Groceries or Restaurants?

C. Groceries or meals at fancy restaurants?

From Chapter 5:

The demand for **necessities** (groceries) are less price-elastic than the demand for luxuries (meals at fancy restaurants).

- So, a tax on restaurant meals would cause a larger DWL than a tax on groceries.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

22

CASE STUDY How Big Should the Government Be? – 1

- **If taxes result in large DWL**
 - The DWL = strong argument for a **leaner** government (does less and taxes less)
- **If taxes impose small DWL**
 - Government programs are less costly than they otherwise might be
 - Argument for a more **expansive** government.
- **Marginal tax rate on labor income = 40%**
 - Social Security tax, Medicare tax, federal income tax, state income taxes
 - **Biggest source** of government revenue

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

23

CASE STUDY How Big Should the Government Be? – 2

40% marginal tax rate on labor income – how big is the **DWL**?

- Depends on the elasticity of labor supply
- **Some economists believe the labor supply is fairly inelastic**
 - Almost **vertical**: most people would work full-time regardless of wage
 - Workers in their prime working years and main breadwinners of their families
 - Tax on labor leads to a small **DWL**

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use.

24

CASE STUDY How Big Should the Government Be? – 3

Other economists: labor supply is more elastic

- Labor taxes are highly distortionary
- Many groups of workers have elastic supply and respond more to incentives
 - Many workers can adjust their hours
 - Some families have 2nd earners; some discretion over whether and how much to work
 - Many of the elderly can choose when to retire; may decide to work part-time
 - Some people work in the “underground economy” to evade high taxes

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 25

ASK THE EXPERTS

The Laffer Curve

“A cut in federal income tax rates in the United States right now [2012] would lead to higher national income within five years than without the tax cut.”

What do economists say?

Source: IGM Economic Experts Panel, June 26, 2012.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 26

DWL and Tax Revenue as Taxes Vary

- **As the tax increases**
 - Deadweight loss increases
 - Even more rapidly than the size of the tax
 - Tax revenue
 - Increases initially
 - Then decreases
 - The higher tax: drastically reduces the size of the market

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 27

EXAMPLE 5: DWL and the Size of the Tax – 1

Initially, the tax is T per unit.

- Increasing the tax to $2T$ per unit...
- causes the **DWL** to more than double.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 28

EXAMPLE 5: DWL and the Size of the Tax – 2

Initially, the tax is T per unit.

- Increasing the tax even more, to $3T$ per unit...
- causes the **DWL** to more than triple.

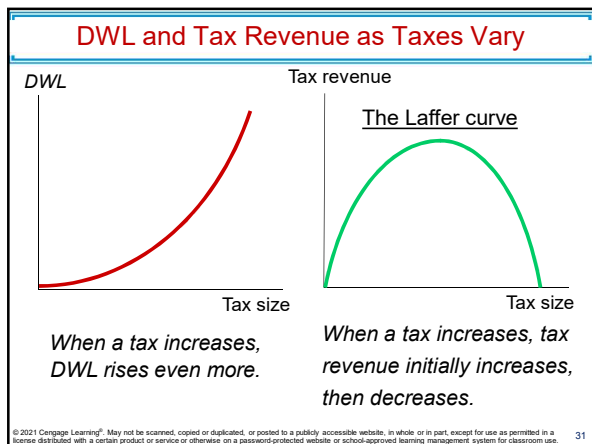
© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 29

EXAMPLE 6: Revenue and the Size of the Tax

When the tax is small, increasing it causes tax revenue to rise.

When the tax is larger, increasing it causes tax revenue to fall.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 30



ASK THE EXPERTS

The Laffer Curve

“A cut in federal income tax rates in the United States right now would raise taxable income enough so that the annual total tax revenue would be higher within five years than without the tax cut”

What do economists say?

0% agree 4% uncertain

96% disagree

Source: IGM Economic Experts Panel, June 26, 2012.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 32

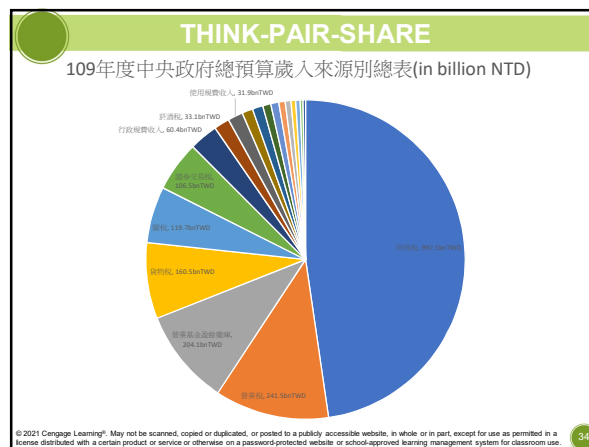
THINK-PAIR-SHARE

You are watching Econman's YouTube channel with your mom. Econman reports that Taiwan has a budget deficit of NT\$204.1 billion in 2020 that it is financing with investment gains (mainly via central bank's foreign investments!!). Taiwan currently collects NT\$241.5 billion from its 5% sales tax.

Mom says, "Taiwan can fix its deficit by increasing the sales tax to 10%. That will increase tax revenue to NT\$483 billion providing the needed NT\$204.1 billion."

- Will doubling a tax always double the tax revenue? Why or why not?
- Will increasing the sales tax affect tax revenue and DWL in all markets to the same degree? Explain.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 33



CHAPTER IN A NUTSHELL

- A tax on a good reduces the welfare of buyers and sellers, and the reduction in CS and PS usually exceeds the revenue raised by the government.
 - The fall in total surplus is DWL of a tax.
- Taxes have **deadweight losses (DWL)**.
 - Buyers consume less and pay a higher P.
 - Sellers produce less and receive a lower P.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 35

CHAPTER IN A NUTSHELL

- Large S and D **elasticities**: larger DWL
- As a tax grows larger
 - Distorts incentives more
 - Its DWL grows larger
 - Tax revenue first rises with the size of a tax, but if the tax gets large enough, tax revenue starts to fall.

© 2021 Cengage Learning®. May not be scanned, copied or duplicated, or posted to a publicly accessible website, in whole or in part, except for use as permitted in a license distributed with a certain product or service or otherwise on a password-protected website or school-approved learning management system for classroom use. 36

Chapter 8: The Costs of Taxation

- ▶ Welfare Analysis of Taxation
- ▶ Deadweight Loss (Harburger Triangle)
- ▶ Homework:
 - ▶ Mankiw, Ch.8, Problem 2, 4, 5, 8, 10

2020/10/22

The Cost of Taxation

Joseph Tao-vi Wang

Chapter 8: Challenge Questions/ex-Midterm

- ▶ 2007 - Essay Q3, Q4
- ▶ 2008 - Essay B (Multi-Choice Q8)
- ▶ 2009 - Essay A (Multi-Choice Q12)
- ▶ 2010 - Essay B
- ▶ 2012 - Essay A10-A12, B (True/False Q7-Q8)
- ▶ 2013 - Essay C, D (True/False Q9-Q10)
- ▶ 2014 - Essay A
- ▶ 2017 - Essay A
- ▶ 2019 - Essay B2

2020/10/22

The Cost of Taxation

Joseph Tao-vi Wang